NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF Instrumentation and Control Engineering

COURSE PLAN – PART I			
Name of the programme and specialization	Instrumentation and Control Engineering		
Course Title	Power Electronics		
Course Code	ICPE31	**No. of Credits**	3
Course Code of Pre-requisite subject(s)	ICPC18		
Session	**July 2019**	**Section (if, applicable)**	NA
Name of Faculty	Mrs. K. LAKSHMI	**Department**	
Official Email	lakshmik@nitt.edu	**Telephone No.**	9940934251
Name of Course Coordinator(s) (if, applicable)	Nil		
Official E-mail	–	**Telephone No.**	–
Course Type (please tick appropriately)	☐ **Core course**	☑ **Elective course**	

Syllabus (approved in BoS)

Power semiconductor switches: SCRs - series and parallel connections, driver circuits, turn-on characteristics, turn off characteristics.
AC to DC converters: Natural commutation, single phase and three phase bridge rectifiers, semi controlled and fully controlled rectifiers, dual converters.
DC to DC converters: Voltage, Current, load commutation, thyristor choppers, design of commutation elements, MOSFET/IGBT choppers, AC choppers.
DC to AC converters: Thyristor inverters, McMurray-Mc Murray Bedford inverter, current source inverter, voltage control, inverters using devices other than thyristors, vector control of induction motors.
AC to AC converters: Single phase and three phase AC voltage controllers, integral cycle control, single phase cyclo-converters - effect of harmonics and Electro Magnetic Interference (EMI).
Applications in power electronics: UPS, SMPS and Drives.

COURSE OBJECTIVES

- To introduce to student, the theory and applications of power electronics systems for high efficiency, renewable and energy saving conversion systems.
- To prepare students to know the characteristics of different power electronics switches, drivers and selection of components for different applications.
- To develop students with an understanding of the switching behaviour and design of power electronics circuits such as DC/DC, AC/DC, DC/AC and AC/AC converters.

MAPPING OF COs with POs

Course Outcomes	Programme Outcomes (PO)

1. On completion of this course students will be able to identify, understand and classify the devices for power plants and various industries	1, 2
2. Able to select the appropriate devices for a given design.	1,2

COURSE PLAN – PART II

COURSE OVERVIEW

The course gives the basic knowledge about the modern power semiconductor devices, that are used as switches to do the power conversions from ac-dc, dc-dc, dc-ac, and ac-ac. It also gives the detailed study of operation and analysis of various power converters and the applications of power electronics circuits.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	I	Power semiconductor switches (Introduction), Gate turn-on methods, Two transistor analogy	Chalk and Talk
2.	II	SCRs - series and parallel connections Driver circuits	Chalk and Talk
3.	III	Turn-on characteristics and turn off characteristics.	Chalk and Talk
4.	IV	AC to DC converters: Natural commutation, single phase and three phase bridge rectifiers	Chalk and Talk
5.	V	Semi controlled and fully controlled rectifiers, dual converters	Chalk and Talk
6.	VI	DC to DC converters: Voltage, Current, load commutation, thyristor choppers	Chalk and Talk
7.	VII	Design of commutation elements, MOSFET/IGBT choppers, AC choppers.	Chalk and Talk
8.	VIII	DC to AC converters: Thyristor inverters, McMurray-Mc Murray Bedford inverter	Chalk and Talk
9.	IX	Current source inverter, voltage control	Chalk and Talk

10.	X	Inverters using devices other than thyristors, vector control of induction motors.	Chalk and Talk
11.	XI	AC to AC converters: Single phase and three phase AC voltage controllers integral cycle control	Chalk and Talk
12.	XII	Single phase cyclo-converters - effect of harmonics and Electro Magnetic Interference (EMI)	Chalk and Talk
13.	XIII	Applications in power electronics: UPS, SMPS and Drives	Chalk and Talk

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week	Duration	% Weightage
1.	Unit Test I	VI	1 hour	20
2.	Unit test II	IX	1 hour	20
3.	Assignment/ Seminar	XI	---	10
4.	Final Assessment	XIV	3 hours	50
CPA	Compensation Assessment	XII	1 hour	20

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

- Direct feedback from the students and through the class committee meetings.
- Students performance in test and their presentation will be used to assess the understanding level.

COURSE POLICY (including compensation assessment to be specified)

- One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- The passing minimum will be either 35% or (Class average/2) whichever is greater.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.

- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

FOR APPROVAL

Course Faculty (K. LAKSHMI) **CC- Chairperson** 8/8/19 **HOD** 9/8/19